# Scientific Crossbow Test

By Jon Teater

# Mission MXB-360

It's been quite a few years since a Mathews or Mission Archery product has gone through my testing regime, mostly because of my focus on crossbows rather than compound bows. It was surprising yet not totally unexpected when Mission released a new crossbow late last year. Crossbows continue to grow in importance in the archery market and Mathews Authorized Retailers have been asking for their favorite bow supplier to get into that side of the market. Mathews is the parent company of Mission, so it's not unexpected to see Mathews engraving on the rail, including a bit of Mathews flair throughout the design.

Mathews and Mission Archery sell not only a product but an experience. Many archers enjoy the feeling of having a top quality product in their hands. Years ago, I can remember testing my first Mathews product. I can vaguely recall the model but more importantly, I can describe the feeling I had while shooting. The balance, draw cycle and firing sequence, which by today's standards are probably considered outdated, were better than top-notch at the time. In fact, I can honestly say many of the past Mathews bows, including the one I'm reminiscing about, were heads above the rest. If you look at today's great bow designs, Mathews products still remain in the forefront. I would say its product portfolio exudes elegance. But archers won't just buy based on looks. What Mathews works to create is the ultimate shooting experience. Therefore, designers of the MXB-360 paid close attention to performance characteristics while creating each component. The product design team released a product that they believe hits all the high points and Matt McPherson expects the MXB-360 to be a leader. The company wanted the crossbows in the Mission line to be fast, quiet and accurate. Additionally, the product needed to be light in weight, well balanced and easy to use, which can be a lot to ask in the design tradeoff process. Bottom line: the Mission line is a new experience and I suspect this product is the first of many new crossbows to come from the Sparta, Wisconsin headquarters.

## Mission MXB-360

| | | | |
|---|---|---|---|
| Contact Info | Mission Archery<br>www.missionarchery.com | | |
| **MSRP** | **$899** | **Finish:** | **Lost AT™ /Black** |
| **String/Cable Material:** | **Zebra™ Hybrid** | **Stock:** | **Composite** |
| **Limb Material:** | **Proprietary Composite** | | |

**Performance at a Glance:**

| Arrow | Speed | K.E. | Momentum |
|---|---|---|---|
| 425 Grains | 348.6 | 114.7 | 21.1 |
| 475 Grains | 332.1 | 116.4 | 22.5 |
| 525 Grains | 316.2 | 116.6 | 23.7 |

## Dimensions

| Model | Axle-to-Axle (inches) | Axle-to-Axle (full draw) (inches) | Power Stroke (inches) | Overall Length (inches) | Mass Weight (including scope) | Mass Weight (without scope) |
|---|---|---|---|---|---|---|
| Mission MXB-360 | 17.75 | 12.375 | 14 | 35 | 7.7 lbs | 6.5 lbs |

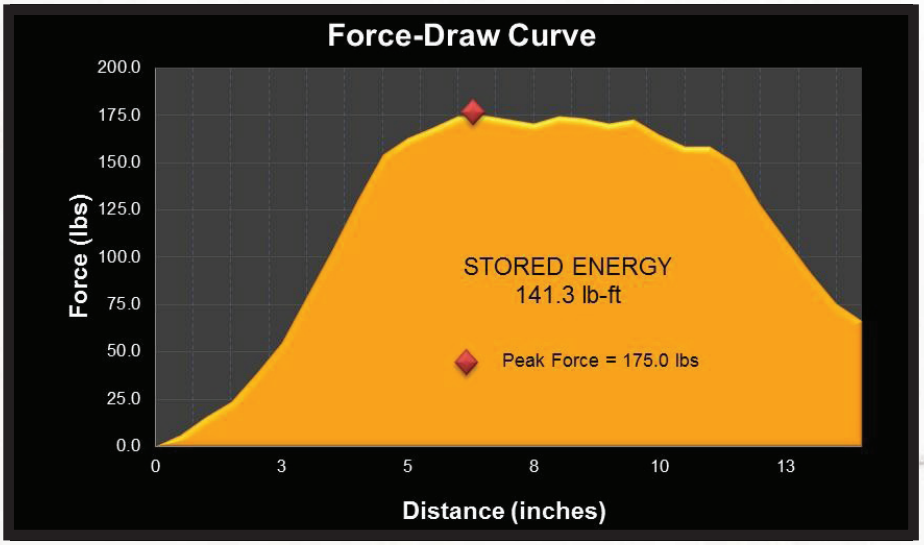
## Testing Background

The MXB-360 went through a standard and regimented performance test. The focus was to determine the performance characteristics. Additionally, the goal was to provide appropriate objective information, as well as some subjective commentary, for aiding in the purchase process. With that said, this evaluation is by no means conclusive. Each archer should assess what is important to him or her and interpret the results within the context of this article. As always, I recommend that anyone who is considering buying a crossbow should shoot as many different makes and models as possible to determine what best suits his or her individual needs and desires.

## Introduction

Mission Archery announced the release of the MXB-360 in September of 2012.

At the time, Matt McPherson, owner and CEO of Mission Archery Inc. and Mathews Inc., said he designed the MXB-360




to give retailers and consumers a fast, powerful and accurate crossbow that is also lightweight, balanced and extremely easy to use. "We've spent a few years listening to our retailers ask us to build a crossbow," McPherson explained. "We're confident the MXB-360 is going to be a new leader in terms of crossbow performance."

Both the Mathews and Mission lines have dedicated consumer bases. As you may expect, Mission is probably the more sensible company for this product release. Mathews is a more traditional company, meaning it is strictly bow focused. Mission Archery is slightly more edgy and, from my standpoint, less susceptible to criticism when releasing a product that's somewhat unconventional. At the time of release, this new product received a lot of publicity. The popularity is really no surprise due to the large following the Mission brand has built in the past few years. In fact, I have several hunting partners that purchased the MXB-360 late last year. So, in my local shooting circuit, many archers knew that Mission had entered the crossbow market and trusted their cash to its introductory model.

The Mission line reflects the look of elegance that I mentioned earlier. The designers worked hard to mix eye appeal with high performance. Matt McPherson predicted this product would be a leader in performance. Being a leader in this market is a difficult feat, since Mission is competing with firms that have honed their crossbow designs and manufacturing skills over decades. Still, the MXB-360 has some unique features that help it stand out. This first Mission crossbow is advertised to weigh 6.55 pounds, which mirrors exactly the measurement I obtained with my certified scales. With a scope, the product weight jumps up but even so, this is one of the lighter crosssbows on the market today. Some of the elements that reduce weight are the skeleton-like barrel, the light forearm and the stock.

The MXB-360 has a tactical look and feel to fit the market trends and from my standpoint, it looks superb. I like the harmonious combination of camouflage and black. The limbs and portions of the stock are embossed in Lost AT, while the remaining portions of the crossbow are black. The crossbow is sold in a complete package. The accessory package includes an MX-3 quiver and three Mission crossbow arrows, weighing approximately 300 grains without their tips. The package includes an option of three scopes: XB Basic, XB Hunter or XB Pro. All these scopes are by Hawke, known for its fine crossbow optics. (Scopes for crossbows are specially designed to correct for parallax at short range and to stand up to the peculiar recoil of these hunting arms.) For this test, the product was provided with all the mentioned components, including a Hawke XB-1 (XB Pro).

The crossbow dimensions and weights measured out of the box are listed on the previous page.

The crossbow went through a thorough inspection. The review focused on the string/cables, the eccentrics, the limb and limb pockets, the rail, the stock, the butt plate, the trigger housing, the trigger and the trigger guard. After a thorough review of the MXB-360, I was unable to find any blemishes. I would rate the product as exceptional in the workmanship section. Thereafter, I put

| Test Category | Assessment |
|---|---|
| Dynamic Efficiency | Provides an indication of the amount of energy output by a crossbow relative to the energy expended through drawing the crossbow back. An assessment is made with multiple projectile weights. |
| Speed per inch of Power-Stroke | Provides an indication of the amount of speed output by the crossbow over the distance from the full-draw position to the static brace height position. An assessment is made with multiple projectile weights. |
| Noise Output | Provides an indication of the noise output characteristics of a crossbow at the "point blank" range utilizing a series of shots with multiple projectile weights. |
| Trigger Force | Provides an indication of the amount of force required to discharge a given crossbow. |
| Precision Test | Provides an indication of how close groups are shot together by shooting from a bench rest or other supportive device. |

## Speed Information

| shot | Weight (grains) | Chrono 1 | Chrono 2 |
|---|---|---|---|
| 1 | 425 | 348.1 | 344 |
| 2 | | 348.8 | 345 |
| 3 | | 348.8 | 345 |
| 4 | | 348.7 | 345 |
| 5 | | 348.7 | 345 |
| avg (fps) | | 348.6 | 345 |

| shot | Weight (grains) | Chrono 1 | Chrono 2 |
|---|---|---|---|
| 1 | 475 | 332.1 | 328 |
| 2 | | 332.3 | 328 |
| 3 | | 332.0 | 328 |
| 4 | | 332.2 | 328 |
| 5 | | 332.1 | 328 |
| avg (fps) | | 332.1 | 328 |

| shot | Weight (grains) | Chrono 1 | Chrono 2 |
|---|---|---|---|
| 1 | 525 | 316.5 | 313 |
| 2 | | 316.2 | 313 |
| 3 | | 316.1 | 313 |
| 4 | | 316.2 | 313 |
| 5 | | 316.2 | 313 |
| avg (fps) | | 316.2 | 313 |

the product through a 100-150 shot cycling to verify functionality. Some minor testing was performed but the focus was to detect any issues or concerns with the product before starting the actual performance testing. The MXB-360 performed flawlessly. One item I did note was the way the archer must be aware of the location of the cocking rope while attaching the clips prior to drawing the crossbow. The rope can sometimes become latched under the crossbow. If this happens, the archer will be unable to draw the crossbow string back. This happened several times during my initial testing until, after a little practice, I became adept at avoiding that issue.

The crossbow was next evaluated on the five criteria outlined below.

### Detailed Test Results

**Dynamic Efficiency:** The dynamic efficiency portion of the test utilized a Revere Load-Cell controlled by a winch device; the load-cell connects to the crossbow with a cocking aid. The crossbow was mounted in a shooting platform that controlled any movement that might be experienced as Force-Draw curves were taken. The stored energy obtained from the Force-Draw curve was used in conjunction with speed measurements to calculate dynamic efficiency.

| | Weight | Speed Per Inch of PS |
|---|---|---|
| Speed per inch of Power Stroke (PS) | 425 grains | 24.9 |
| | 475 grains | 23.7 |
| | 525 grains | 22.6 |
| | Average | 23.7 |
| Powerstroke | 14 | inches |

**Speed per inch of Power Stroke:** Speed measurements were taken with three projectiles. A Pact Chronograph XP and a Competition Electronics Pro-Chrono IR were set in tandem to record results. The average speed measurement was divided by the power stroke to determine the speed per inch of power stroke.

**Noise Output:** Sound measurements were recorded with three projectiles. The measurements were averaged and the sound meter was set to take measurements with the A-weighted filter (which mimics the human ear).

**Trigger Force:** The Trigger Force measurements were recorded in pounds and averaged. An Imada Digital Force Gauge was used to determine the peak Trigger Force.

**Precision Measurements:** Provides an indication of how tight groups were when shooting the crossbow by hand from a bench rest or other supportive device. Extreme spread was the

## Trigger Analysis

| | Trigger Pull (lbs) |
|---|---|
| 1 | 3.70 |
| 2 | 3.64 |
| 3 | 3.62 |
| 4 | ~~3.58~~ |
| 5 | 3.72 |
| 6 | 3.77 |
| 7 | 3.76 |
| 8 | ~~3.80~~ |
| 9 | 3.66 |
| 10 | 3.59 |
| 11 | 3.68 |
| 12 | 3.69 |
| 13 | 3.68 |
| 14 | 3.78 |
| 15 | 3.61 |
| Pull (lbs) | 3.68 |

| Performance Information | | | |
|---|---|---|---|
| Peak Force | | 175.0 | lbs |
| Stored Energy | | 141.3 | lb-ft |
| Dynamic Efficiency | 425 grains | 81.2 | percent |
| Dynamic Efficiency | 475 grains | 82.4 | percent |
| Dynamic Efficiency | 525 grains | 82.5 | percent |

method used to calculate the group size, measured by a digital calipers.

## The Initial Review

I was happy to receive the MXB-360. Upon opening it, I noticed the crossbow was well packaged. While segregated from the box containing accessories, the crossbow was retained in a case. In fact, this is the first soft case I can remember ever receiving with a crossbow. The case is an excellent touch and a feature that archers are sure to enjoy.

The crossbow was received almost fully assembled. The only components requiring assembly were the scope and quiver bracket. For this test, the scope and quiver bracket were not used and it took just 5 to 10 minutes to precisely position the scope for proper head/eye alignment.

After assembly, I read through the user manual. The manual encompasses safeguards, cocking instructions, specifications, maintenance and warranty. It's important to run through the crossbow safety rules with customers. While reading the instructions, I was reminded that all Mission crossbows are tested before they leave the factory. The safety instructions are quite detailed and include sharp pictures and information on the dos and don'ts of the MXB-360.

An important aspect of the design is the anti-dryfire component. If a dryfire occurs, this component has the ability to prevent crossbow damage and possible harm to the shooter.

Safe use of crossbows at the range or in the field is essential for the longevity of the product, as well as the safety of the archer. The MXB-360 has safety warnings "plastered" all over it. First and foremost, orange tape is placed over the string and the crossbow can't be fired until the tape is removed. Mission placed a caution sticker on the product, which was an excellent idea, since you can't use the crossbow until it's removed and you

| Sound Measurements | | | |
|---|---|---|---|
| Weight (grains) | 425 | 475 | 525 |
| Parameter | Peak A -Weighted Noise | | |
| 1 | 94.2 | 92.4 | ~~91.6~~ |
| 2 | 93.8 | 92.4 | 91.5 |
| 3 | 94.0 | 92.5 | ~~91.1~~ |
| 4 | ~~94.2~~ | ~~92.1~~ | 91.2 |
| 5 | 93.7 | 92.4 | 91.2 |
| 6 | 93.7 | 92.3 | 91.2 |
| 7 | ~~93.5~~ | 92.4 | 91.2 |
| 8 | 93.7 | 92.3 | 91.1 |
| 9 | 93.7 | 92.5 | 91.4 |
| 10 | 93.8 | ~~92.6~~ | 91.3 |
| | | | |
| Average | 93.8 | 92.4 | 91.3 |
| Total Avg Max (dBA) | 92.5 | | |

are forced to look at it. The caution notice on the orange tape is very clear; it requests the user to read the owner's manual, as well as register the product. In addition, stickers on either side of the wings of the forearm remind the archer to keep hands in a safe location to avoid contact with the string while firing. The final safety notices are located on the limbs. The limb stickers reiterate key points of the user manual. For example, the minimum arrow weight is 400 grains, the user must ensure proper vane orientation, the user must use moon nocks only and the user must engage the safety after loading. I mentioned only half the notices, so pay close attention to the safety markings.

Finally, there are limited lifetime warranty terms and conditions with the MXB-360. I recommend that anyone that considers buying this crossbow read through these terms in detail. The terms are also posted on Mission's website. There are strict rules and procedures to register the crossbow, activate the warranty and make a claim.

## In The Field

With winter coming to an end and the weather starting to break, I had time to take the MXB-360 afield. The initial characteristics that most crossbow shooters notice are the weight, feel and balance. The weight aspect is superb, at 6.5 pounds as a bare crossbow; this product is comparable to some of the lightest available today. The crossbow did feel good in my hands; however, the length of pull may be too long for some shooters. (As a reminder, length of pull is the distance from buttstock to trigger.) The balance point (pivot) is at an almost optimal location for my shooting style. The pivot is precisely located at the tail end of the forearm, near the trigger guard.

With many of today's crossbows, you experience little to no let-off. In fact, only a few crossbows available today are truly focused on producing let-off. Some will say this aspect is unimportant and has little impact on the archer using a rope cocking aid but I disagree. Drawing a crossbow in a treestand or on the ground can be difficult for the last few inches of the drawing sequence. You can teach a customer to bend his legs and use those powerful muscles for most of the cocking process but once the legs are straight, then weaker shoulder and arm muscles have to take over. The MXB-360's force draw curve indicates a steady drop-off into the valley, reducing any struggle the user may experience. In fact, the measured holding weight is around 66 pounds, which is particularly low, considering the peak weight is around 160-170 pounds.

A primary difference between the MXB-360 and other crossbows, something that became noteworthy in the field, is the lack of a stirrup at the front end. The designers felt that reducing the overall length of the crossbow would be beneficial in the field. Let me tell you, it was! Crossbow length and weight can be issues with some customers, whether they're used to carrying a bow or a rifle. The MXB-360 feels no different than a rifle on my back. The cleat design of the MXB-360, which replaces the stirrup on a traditional crossbow, allows the user to place his or her foot on either side of the crossbow while drawing. This feature played a huge part in allowing me to easily cock the crossbow while in the treestand.

As I typically do, I brought the MXB-360 to my predetermined shooting location, with four targets spaced at various distances. The furthest target was almost 50 yards away. My treestand includes a removable shooting rail, so I am able to test with or without support. The crossbow performed flawlessly during this shooting sequence. I was conscious to make sure I lubricated

### ArrowTrade Scorecard

| Evaluation Criteria | Score |
|---|---|
| Adjustability | |
| Craftsmanship | |
| Design Integrity | |
| Features | |
| Performance | |
| Sound | |
| Trigger | |
| Vibration | |

Note: The ratings are based on the following color codes:
Blue = exceptional,
Green = above average,
Light Green = average,
Yellow = marginal,
Red = unacceptable

### Projectile Precision

| | Model/ Brand | Arrow Weight | Distance (yards) | Spread 1 (inches) | Spread 2 (inches) | Average (inches) |
|---|---|---|---|---|---|---|
| Shooting by Hand | Mission | 402.1 | 40 | 1.796 | 1.730 | 1.763 |
| Shooting By Hand | Mission | 402.5 | 40 | 2.070 | 1.940 | 2.005 |

the rail every 15 to 20 shots, as recommended by the crossbow manual. The component that stood out the most during this portion of the test was the Hawke scope, which is outstanding. The reticle setup is unique and was designed for easy target acquisition. In fact, I would rate the XB Pro to be one of the best scopes available and it certainly aided my shooting. The crossbow hit the mark in the field; the projectile precision provided herein from indoor testing mirrored what I experienced in the field. And from my standpoint, you can't ask for a product to shoot better than 2 inch groups at 40 yards.

## Hot Features

Many of the top selling features of this product have already been mentioned. The pistol grip, customized case, adjustability, efficient design, comfortable trigger, telescopic sight, cleat design and performance output come to my mind as elements that will grab a consumer's attention. The unique look of the design, starting with the skeletonized barrel, which extends rearward toward the stock, is eye catching. The drawing sequence and quiet output of the limb/cam configuration are ideal for a hunting situation. Further, the limb/cam design is one of the most efficient I have tested to date, reaching greater than 80 percent. (Please note that the draw weight of the MXB-360 is adjustable downward to 100 pounds and efficiencies will be impacted when reducing the crossbow from peak weight.)

The trigger pull is in that optimal range for my shooting style of between 3.5 and 4 pounds. The final noteworthy characteristic is the previously mentioned stirrup-free design. With this approach, Mission proves sometimes you can do more with less.

## Possible Refinements

I found several areas I felt could be improved upon in the next rendition of this model or in additional models from Mission. The stock and forearm, including the pistol grip, lack frictional areas. Some products include checkering or rubberized material to allow the archer to make firm contact with the crossbow. Without these high friction areas, the crossbow could be more difficult to handle in the field, especially in wet conditions. The next area is the cocking rope anchor. I did see the benefit in this concept; however, the location does not seem convenient and can be somewhat problematic when trying to quickly cock the product; practice can alleviate this concern. The third area is a debatable point because this is an area of personal preference and is constantly discussed amongst designers. I prefer an auto-engaged safety, which the MXB-360 does not have. Please ensure that consumers are aware that this product needs to be placed on "safe" after it is cocked, similar to a firearm. The final element I'd like to see improved upon is the length of pull. From my standpoint, the length of pull will be too long for certain archers. My suggestion is that Mission could include a stock that has some built in adjustability; this will alleviate any issues from those with shorter or longer arms.

## Summary

Mission has produced a great first crossbow after several years of rapid growth in vertical bow sales. The MXB-360 can be sold with three different scopes, providing different pricing levels. The reputation of the manufacturer and of designer Matt McPherson makes this product desirable. Consumers love Mathews and Mission has a lot of the same appeal, so use this to your advantage. I would also highlight the performance concepts; this crossbow's speed measured just under 360 fps in my test with a 400 grain arrow. Speed does sell but noting the high efficiency and low noise output will help consumers understand this product isn't just your average crossbow. The final selling method is to highlight the looks. From a distance, the MXB-360 exudes elegance and users may be easily drawn to this product because of that. The eye appeal of the MXB-360 will be far greater than some of the latest crossbows from other brands. Much of the allure comes from the stirrup-free design and tactical look.

Overall, I enjoyed testing this product and I'm very pleased to see Mission Archery in the crossbow market!